REMARKS

Applicants request reconsideration of the application in view of the following remarks. Claims 37-52 are pending. Claims 1-36 previously were canceled.

Claim Rejections - 35 U.S.C. §103

Rejection of Claims 37, 38, 41-44, 46-47 and 50-51 Based on Takahashi,Tikkanen, Ruppert, Bocko and Kuisl

Applicants respectfully request reconsideration and withdrawal of the rejection of claims 37, 38, 41-44, 46-47 and 50-51 under 35 U.S.C. §103(a) as being unpatentable over Takahashi (US 4,388,098) in view of Tikkanen (FI 988328), Ruppert (US 6,079,225), Bocko (US4,604,118) and Kuisl (US 4,564,378).

Claim 37 is directed to a method for forming multicomponent glass particles in a flame and spraying the glass particles to a target. This method includes *inter alia* the following steps (emphasis added):

supplying a fuel gas through a nozzle of a spraying device to produce a flame outside of the nozzle;

introducing oxygen through the nozzle to the flame;

introducing a first glass component through a gas tube and through the nozzle to the flame, wherein the first glass component consists of a gaseous or vaporous substance;

introducing a second glass component through a liquid tube and through the nozzle to a vicinity of the flame, wherein the second glass component comprises a liquid solution containing a rare earth metal;

introducing an atomizing gas through the nozzle to the vicinity of the flame;

atomizing the second glass component with the atomizing gas in the vicinity of the flame; and

guiding multicomponent glass particles comprising the rare earth metal formed in the flame onto the target.

Thus, in claim 37, a first glass component is introduced to the flame in gas or vapor form in a gas tube, and a second glass component, including a rare earth metal, is introduced in aqueous or liquid form by a separate liquid tube and is then atomized by the atomizing gas in the vicinity of the flame. There are two separate tubes, meaning that there are two separate "feedstocks" – the first glass component and the second glass component, which are introduced through these different tubes that emerge from different orifices in the nozzle that come together at the flame. The first glass component is introduced as gas or vapor and the second glass component is a liquid solution containing a rare earth metal.

Similarly, claims 42, 44, 46 and 51 also require that there are two separate glass feedstocks, in which a first glass component is introduced as gas or vapor and the second glass component is a liquid solution containing a rare earth metal.

The separate glass feedstocks are important to the applicants' invention. When making their invention, the applicants observed that their first glass component, usually $SiCl_4$, tended to react more slowly with oxygen than did rare earth metals. As a consequence, dopant particles would accumulate into the core of multicomponent glass particles, while silicon oxide particles placed themselves on the outside (or formed a clad layer over the dopant particles). In the claimed invention, applicants produce more homogeneous multicomponent glass particles by atomizing the liquid glass component that incorporates a dopant component in the vicinity of the flame, in combination with introducing a separate gaseous glass component to the flame. There is better mixing in the flame in this flame hydrolysis method. This prevents sequential deposits of different components.

Production of multi-component glass particles is complex. Indeed, Takahashi states that methods for making multi-component glass fibers are "not simple", and that it is "not so easy to mix the starting materials homogeneously" (Col. 1, lines 43-46). There have been many different methods and apparatus proposed. Notwithstanding these difficulties, the Examiner seeks to combine teachings of different references without regard to those portions of the references that teach away from the proposed combination.

Takahashi discloses producing multi-component glass fiber preforms by nebulizing an aqueous solution of at least one metal salt, and reacting the atomized solution and a gaseous glass raw material with oxygen gas at high temperature to produce particulate glass material deposited on a substrate (Col. 1, line 65 to Col. 2, line 2). Takahashi illustrates different ways to carry out this method, and only the apparatus of FIGs. 3 and 4 uses a multi-conduit burner. Referring to FIGs. 3 and 4 and the accompanying text of Takahashi, the multi-conduit burner 31 introduces a gaseous glass raw material (such as $SiCl_4$ carried by argon gas) through one conduit, and a nebulized metal salt solution through another conduit, as well as fuel (e.g. hydrogen) and oxygen gases through other conduits. The metal salt solution is nebulized in a separate unit, and only subsequently introduced through a conduit to the vicinity of a flame. Takahashi does not disclose atomizing the metal salt solution in the vicinity of the flame. Atomization in the vicinity of the flame enhances mixing, which in turn facilitates producing more homogenous multi-component glass particles. Thus, the methods claimed by the present applicants differ from that disclosed in Takahashi.

The Examiner appears to assert that a skilled person would recognize a problem with use of nebulizers from the content of Tikkanen and, as a result, would seek to replace the nebulizer in Takahashi with another approach. Applicants respectfully disagree with this assertion. First, the Examiner relies upon an English-language translation of Tikkanen prepared by Schreiber Translations, Inc. in April 2003. Page 4, lines 14-16 of the translation of Tikkanen prepared by Schreiber Translations recites:

> "...feeding pi-tetrachloride as a steam into the equipment with the help of aerosol is slow...".

Applicants respectfully submit that this passage upon which the Examiner relies was not translated accurately.

Applicants provide herewith a certified English-language translation of Tikkanen that is accurate. Referring to this certified English-language translation, when discussing US 3,883,336, Tikkanen actually recites:

> "...feeding silicon tetrachloride as a vapour by means of a carrier gas to the device is slow, since if there is an excess of silicon tetrachloride in proportion to the carrier gas, it is nucleated into larger droplets, and sufficiently small particles can thus not be sprayed."

(certified translation, page 1, lines 29-32). This passage clearly teaches that the use of gaseous silicon tetrachloride would be ineffective. As a result, Tikkanen directs skilled persons to introduce ***all*** components in ***liquid*** form so as to be atomized by a gas substantially in the vicinity of the flame (certified translation, page 2, lines 10-15). Thus, Tikkanen does **not** combine a separate gas or vapor glass feedstock with a separate liquid glass component feedstock that includes a rare earth metal. Tikkanen instead teaches away from using any gas or vapor glass feedstock, which is required in the methods of Claims 37, 42, 44, 46 and 51.

A skilled person would have no motivation to combine Takahashi with Tikkanen. Takahashi concerns only gaseous or atomized materials (i.e., gaseous glass raw material (such as $SiCl_4$ carried by argon gas) through one conduit, and a nebulized metal salt solution through another conduit, as well as fuel (e.g. hydrogen) and oxygen gases through other conduits). In contrast, Tikkanen introduces only liquid components that are atomized by fuel gas in the vicinity of the flame. Neither the Takahashi nor the Tikkanen approach has been claimed by the present applicants.

The Examiner proffers that there is motivation to combine Takahashi with Tikkanen to overcome problems with nebulizers. Applicants disagree. In addition to ultrasonic nebulizing, Takahashi also discloses that an aqueous solution may be nebulized by utilizing gas under pressure (Col. 2, lines 18-20). It would not have been obvious to apply the teachings of Tikkanen to improve the pneumatic nebulizing of Takahashi because Tikkanen also discloses that the liquid is atomized (i.e., nebulized) by means of a gas (certified translation, page 1, line 36 to page 2, line1). Nor does Tikkanen expressly teach that pumps could be avoided (certified translation, page 3, lines 3-7). Pressurization of a tank would also require the use of a pump. One would not eliminate pumps if the burner of Tikkanen replaced the burner in Takahashi.

Tikkanen does not disclose how to arrange the process conditions in order to produce homogeneous multicomponent glass particles. Tikkanen teaches that the substance to be sprayed should be in liquid form in order to produce very small particles fast and inexpensively (certified translation, page 2, lines 16-17). A skilled person who wished to modify the burner apparatus in Takahashi to produce more homogeneous multicomponent particles would not find any indication in Tikkanen that the use of Tikkanen's burner structure instead of Takahashi's structure would lead to more homogeneous multicomponent particles. Nor would the skilled person be directed by Tikkanen to try using two separate feeds, in which one glass component is in vapor or gas form.

Nor do the other references relied upon by the Examiner fill the gaps in the disclosure of Takahashi. Ruppert teaches that ultrasonic nebulizing of liquid $SiCl_4$ requires costly pumps and ultrasonic atomizers (Col. 1, lines 23-48). Ruppert proposes to supply atomizing gas through a nozzle such that a low pressure region is created (Col. 2, lines 18-22). Ruppert supplies a glass-forming base material (such as $SiCl_4$) ***in liquid form*** to an injection nozzle (see Abstract). There is no rare earth metal in the liquid glass component. There is no separate gas or vapor glass feedstock.

Bocko discloses synthesizing glass by using silicon tetrachloride and two different vaporous metal source compounds. The vaporous metal source compounds are supplied separately into a flame (Col. 2, lines 22-39). Bocko teaches that vaporous metal source compounds, used for synthesis of glasses may interact. Where they do interact, concentric fume tubes or a gas shield may be used for delivering the reactants separately into the burner flame. Bocko does not include rare earth metal in solution with a liquid glass component.

Kuisl (US 4,564,378) discloses that silicon tetrachloride ($SiCl_4$) may react with water vapor (Col. 2, lines 17-25). The very invention of Kuisl appears to be based on producing a reaction between silicon tetrachloride with water vapor (see abstract). Kuisl does not teach that there would be a need to prevent a reaction between silicon tetrachloride with water vapor, and certainly does not provide motivation to avoid such reaction.

Takahashi teaches that gaseous silicon tetrachloride and a nebulized solution may be mixed in a mixing zone (**32** in FIG. 3) before directing the mixture into the flame (**34** in FIG. 3)(Col. 4, lines 52-67; Col. 7, lines 56-65). In other words, Takahashi expressly teaches pre-mixing gaseous silicon tetrachloride and a nebulized aqueous solution. Mere knowledge that silicon tetrachloride might react with water vapor is not a sufficient incentive to modify or replace the burner structure in Takahashi. Mere knowledge that silicon tetrachloride might react with water vapor is not a sufficient incentive to modify the Tikkanen burner to supply gaseous silicon tetrachloride in a concentric fume tube around the nebulizer where Tikkanen points so clearly to introducing the glass component in liquid form.

None of the cited references teach or suggest the express combination claimed by the present applicants, in which both a gaseous glass component as a first feed and a liquid glass component with a rare earth metal compound as a second feed are introduced to the flame. Thus, even if the references could be combined, such combination does not direct the skilled person to the claimed methods. The Examiner improperly picks and

chooses disparate portions of the cited references without regard to the teachings contrary to the applicants' claimed methods. Claims 39-52 patentably distinguish, and should be allowed.

Rejection of Claims 39-40, 45, 48, 49 and 50-52 Based on Takahashi,Tikkanen, Ruppert, Bocko, Kuisl and Ainslie

Applicants respectfully request reconsideration and withdrawal of the rejection of claims 37, 38, 41-44, 46-47 and 50-51 under 35 U.S.C. §103(a) as being unpatentable over Takahashi (US 4,388,098) in view of Tikkanen (FI 988328), Ruppert (US 6,079,225), Bocko (US 4,604,118), Kuisl (US 4,564,378) and Ainslie (US 4,923,279).

For the reasons expressed above, the pending claims are patentable over Takahashi, Tikkanen, Ruppert, Bocko and Kuisl, whether taken alone or attempted to be combined. Ainslie does not fill the gaps in the disclosures of these other references. Ainslie teaches that light-amplifying optical fibers may be doped with erbium. Ainslie does not use a concentric nozzle burner that introduces separate glass components through separate tubes in atomized liquid and gaseous or vaporous forms to a flame. Instead, Ainslie uses an inside deposition process called modified chemical vapor deposition ("MCVD"). With MCVD, layers of glass are deposited inside a tube, while the tube is heated from the outside. There is no mixing within a flame, and the feed gases are not introduced through a nozzle to a flame.

Ainslie expressly wants to have glass fibers with an inner core that includes dopant material surrounded by a cladding of different composition. Ainslie is not looking to make a homogeneous multicomponent glass particle, as is the aim of the methods claimed by applicants. Ainslie "requires a high concentration of dopant at the axis" of the optical fiber (Col. 3, lines 8-9). To achieve this high concentration of dopant at the axis or core, Ainslie first uses MCVD to create various glass layers inside a tube. Then, the last porous glass layer formed by MCVD on the inside of the tube is doped with a rare earth metal (such as Er) by immersing the tube with the porous glass layer in a rare earth

solution (containing $Al(NO_3)_3$ and $ErCl_3$) for one hour, after which the doped material is separately heated to evaporate the solvent.

Skilled persons would not be disposed to combine Ainslie's teachings -- concerning rare earth metal doping (using erbium chloride – not erbium nitrate) by soaking the porous glass in a liquid solution after MCVD -- with the gas burner flame glass particle methods of Takahashi and Tikkanen. The MCVD technique is completely different and has nothing to do with methods for spraying glass particles to a target. Applicants discovered specific methods for forming homogeneous multicomponent glass particles by spraying the glass particles to a target. In the claimed methods, the doping occurs as the components are reacted in the vicinity of the flame. There is no soaking solution or soaking time. A reference that concerns doping by soaking cannot translate to a method where doping occurs in a flame reaction. The Examiner could find no teaching of erbium nitrate as a doping material in Takahashi or Tikkanen. And in an obviousness analysis the Examiner cannot pick and choose disparate teachings from a separate unrelated reference like Ainslie without regard to whether skilled persons would be motivated to combine such teachings.

Ainslie shows that erbium chloride can be doped into SiO_2 formed by an MCVD process using $SiCl_4$ and other glass components by an immersion method. Ainslie does not use a flame method. So, Ainslie does not teach or suggest anything with respect to whether flame sprayed glass particles can be doped with erbium or other rare earth metals. The relevant inquiry is not only whether a skilled artisan would gather from Ainslie that the particular rare earth metals would be beneficial in resultant glass fibers, as the Examiner has asserted, but also whether a skilled artisan having read Ainslie would have gathered that one could successfully apply those rare earth metals in a flame mixing method as claimed in the pending claims. Ainslie provides no suggestion to apply the particular rare earth metals in such claimed methods.

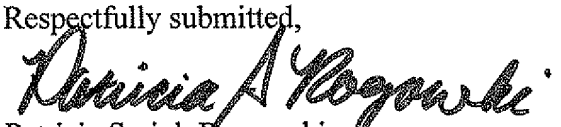
Conclusion

In view of the above remarks, Applicants believe that the rejections should be withdrawn and claims 37 to 52 should be allowed.

Enclosed is a Petition for a Three Month Extension of Time. Also enclosed is a Request for Continued Examination (RCE). Applicants have authorized payment of the requisite fees for such extension and RCE. If any fee remains due before the Examiner may consider this paper, please charge our Deposit Account No. 22-0185, under Order No. 20386-00294-US from which the undersigned is authorized to draw.

Dated: February 17, 2009

Respectfully submitted,



Patricia Smink Rogowski
Registration No.: 33,791
CONNOLLY BOVE LODGE & HUTZ LLP
1875 Eye Street, N.W., 11th Floor
Washington, DC 20036-3425
(202) 331-7111

Attorney for Applicants

Enclosure

Certified English-language translation of FI98832 (Tikkanen)

Request for Continued Examination (RCE)

Petition for 3-Month Extension

Information Disclosure Statement

89669_1